

and the wax taper applied frequently until it permanently ignites the oil; a thermometer placed in the oil will register the point of permanent ignition.

One source of danger arises from carelessly feeding a lamp with oil whilst in a heated state, and another from allowing it to burn down so low that the metal burner becomes heated to such degree that it vapourizes the oil and explosion ensues.

Note.—The original paper was accompanied by tabulated results of tests of various samples of the oil.

ART. XVIII.—*On the Unexplored Districts of Victoria.*

By R. BROUGH SMYTH, Esq., F.G.S. Lon.

[Read 8th September, 1862.]

The remarks I intend to make to-night are rather suggestive than otherwise. There are some districts of the colony wholly unexplored, and it is to these principally that I would wish to direct the attention of the members of this Society. You are aware that the operations of the gold miner have been confined almost exclusively to that large area of the colony which is occupied by rocks,—sandstones, schists, and clay-slates,—belonging to the silurian formation. From the modes of occurrence of gold in alluvia and quartz lodes, easily found and as easily wrought, the miners have not generally sought to explore the deeper tertiaries and the plains covered with basalt, which, I believe, conceal as rich stores of gold as have been found at Castlemaine or Sandhurst. In addition to the auriferous tracts concealed by rocks not older than the newer tertiaries, there are vast areas of silurian rocks wholly unexplored. I may instance the Delatite or Devil's River, a tributary of the Goulburn, which has been only partially examined by an exploring party sent out by the Prospecting Board. That party found rocks exactly similar to those occurring at Jamieson, and at the sources of the Howqua; but owing to the nature of the country, which is described as precipitous, and mostly covered with a dense scrub, they were unable to penetrate further than Emu Creek. This river (the Delatite), takes its rise some thirty or forty miles to the eastward, and as all the creeks on the opposite side of the ranges flowing to the

Ovens and to the Wangaratta, are auriferous, it is but reasonable to conclude that its tributaries also flow over gold bearing rocks. There are also the head waters of the Wangangarra, the Wonongaratta, (on which Howitt found the Crooked River gold fields) several tributaries of the Thomson (on which the Jordan gold-field is situate), the King, the Holland, and the Broken River, whose sources are as completely unknown to the inhabitants of Victoria generally as is the Nile or the Zambesi.

Some years ago, I ventured to recommend several parties of miners, who had the necessary means at their disposal, to explore the head waters of the river Yarra and the tributaries of the Thomson. I did not do this without data. I had previously carefully examined the maps prepared after infinite labour by Mr. Hoddle, formerly Surveyor-General of this colony, and by Messrs. Tyers and Wilkinson, and the conclusions I arrived at after examining their charts and ascertaining from two of them the nature of the rocks, have not been faulty. Gold, as you are aware, has been found at Hawthorn and Icy Creeks, and at Jordan, and I believe these localities (rich as some of them are said to be), are the least important amongst those likely to be found and worked, north, west, east, and south of Mount Baw Baw.

I do not come here, however, to offer for your consideration my personal views, or to force on you my own convictions, I come prepared rather to point out vast areas of the colony which are at present wholly neglected by the miner.

For a long period I have collected from various sources a vast number of facts relative to the nature of the rocks of this country. I have been in communication with many well-informed gentlemen in the colony, and they have kindly afforded data from which I can for the first time, I believe, submit something like a fair statement of the areas occupied by the more important strata.

Rough measurements give the following results :—

	Square Miles.
1.—Granites and other plutonic rocks	2,500 to 3,000
2.—Sandstones, claystones, and slates belonging to devonian, and upper and lower silurian age - - -	25,000
3.—Carboniferous rocks - - -	3,000
4.—Basaltic and volcanic rocks	10,000

	Square Miles.
5.—Tertiary rocks, including the Murray tertiaries and those occur- ring on the seaboard - - -	28,000
6.—Country of which nothing is known at present relative to the rock formations - - -	17,831
	86,831

The total 86,831 square miles, equals the area of the colony as commonly given.

A large proportion of the area of which the geological structure is unknown, consists, probably, of silurian rocks and granites. It lies mostly to the eastward of the meridian of Melbourne, and includes nearly 3,000 square miles of country east of Beechworth and north of Omeo, and a great tract east of the Snowy River. It includes also a great part of the counties of Dundas, Normanby, and Follett, and portions of the counties of Heytesbury and Polwarth, which lie to the west of the meridian of Melbourne. All these areas are very interesting from the very situation of them and one in particular, that east of the Snowy River, is worthy of attention for it has very often been stated that it is rich in minerals and metalliferous ores.

Of the three important divisions, namely the palæozoic sandstones and slates, the basalts, and the tertiaries, it is sufficient to call attention to their distribution. The first appears as a great band some fifty or sixty miles in width, stretching right across the colony, from east to west, and situate mostly between the parallels of $36^{\circ} 30'$ and $27^{\circ} 30'$. To the north is the wide extent of tertiaries through which flows the Murray, and to the south we have 10,000 square miles of basaltic and volcanic rocks, nearly all occurring west of the 145th meridian.

First, with regard to the schists and sandstones: It is not necessary to inform you that only six hundred square miles have been opened up by the miner, and that the remainder has been but partially prospected. It is true that a considerable area was hastily examined by numerous exploring parties during a portion of the years 1860-1, but though their labours led to the discovery of the Crooked River gold-field, some of the tributaries of the Yarra, and the Londonderry rush, besides opening up to some extent the

country at the sources of the Goulburn, and that at the sources of the Wimmera, still there are very extensive areas which have been quite neglected, and which are as likely to embrace remunerative gold-fields as any other parts of the country already opened up. I have already mentioned the Delatite, the King, the Holland, the Broken River, the Wonangarra, the Wonongaratta, and the unknown tributaries of the Thomson and Macalister, and I would now add, as also worthy of examination, the western tributaries of the Wimmera, the unexamined tributaries of the Richardson, and a large area of country west of the Goulburn. It is unnecessary to say, that relatively small areas occurring between well known centres of gold-mining industry are yet to be explored, and their treasures concealed in quartz veins and alluvia yet to be brought to light.

The basaltic rocks, covering as they do a vast area, no doubt, repose on palæozoic sandstones and schists, and strata belonging to the carboniferous age. To what extent denudation may have affected the latter it is impossible to say, but looking to the physical structure of the colony, we may conclude, as more than probable, that the northern margin of this great sheet of volcanic rocks, conceals auriferous deposits immediately resting on schists and sandstone, and at no great depth.

We are not without data from which to judge of the nature of the rocks beneath the basalts and lavas. The workings at Ballarat afford some, but to my mind a clearer view may be obtained of the structure of this kind of country by an examination of the county of Talbot. At Ballarat, the little we know has been exposed after infinite labour and cost by the miners ; but at Daylesford, Yandoit, and in other parts of Talbot, natural forces have scooped out valleys clean through basalt, tertiary, and schist, in such a manner as to lower the now existing water courses some sixty feet below the level of the beds of the old streams. The basaltic rock is nowhere very thick, and yet some of the old centres of igneous action are as imposing in appearance there as those in the south-western parts of the colony. Without careful examination, it is however hard to say whether any of the basalt covering the old leads in the Daylesford district is of its natural thickness. We do not know how much of it may have been carried away.

Without doubt the first attempts to penetrate the western plains may fail, unless there be outcrops of the silurian rocks

in some of the modern valleys, of which we yet know nothing. The forces which have operated to give their present physical character to the exposed hills and valleys of the silurian rocks were at work, and had fashioned the country which is now covered with solid waves of lava, and perhaps the most enthusiastic miners would stop, if they should chance to come upon a valley filled in with some five hundred or six hundred feet of blue-stone; but if they happened to commence their work over some old dividing range, as has often happened at Ballarat, they would the sooner reach the schist in which they could mine with greater facility. I only repeat what has been said by the ablest authorities in the country, when I express the opinion that many rich and extensive leads of gold will probably be found in the northern parts of the great western plains.

It is quite beyond the scope of this short paper to suggest the mode of search in this kind of country, but I believe boring and sinking shafts should follow and not precede exactly such a careful and minute geological survey as has been made by Messrs. Ulrich and Aplin, of a great portion of the County of Talbot.

But little is known relative to the tertiary rocks which occupy so large an area between the silurian belt and the river Murray. What is known would lead to the belief that many of the beds of rounded and angular quartz which in part compose these rocks, will well repay the labours of the gold miner.

Probably the country north of Huntly, and west of the Campaspe, and that north-west of Barnawartha, close to the Murray, will be first explored for gold.

It is in the area of the colony that we may probably hope to find salt-beds, and valuable deposits of sulphate of lime.

Rich veins of iron-ore occur in the Castlemaine and Sandhurst districts, and with abundance of wood the most suitable for charcoal, in close proximity, these in time will be profitably worked.

The metalliferous veins at Reedy Creek will probably yet be explored for silver, and the reports of Mr. Mining Registrar Raven, published as far back as August, 1860, show that St. Arnaud will probably be as attractive for its silver mines as it is now for its gold.

The granites of the Beechworth district, to whose composition special attention was directed by the jurors in Class

IV. at the last Industrial Exhibition, may be examined for the ores of tin, and the granites of the Australian Alps and Pyrenees for kaolin.

I have thus briefly indicated some of the districts of the colony, which are particularly worthy of investigation, and it is certain that if they were properly examined, new and important facts would be disclosed, valuable to the world of science, and leading to the establishment of permanent industries.

The 25,000 square miles of sandstone and clayslates, intersected nearly everywhere by metaliferous and mineral lodes, are an expression of our wealth, and ought to content us, and assure us of a permanent prosperity. But this vast area must be explored, and it would be well for the colony if this learned Society, having just concluded an enterprise far surpassing in its magnitude and in its results anything yet attempted by the Society in London, whose whole aim is to extend geographical research, it would be well, in my humble opinion, if this Society would now devote its energies to enquiries having immediate reference to the physical structure of the colony.

ART. XIX.—*On the Fresh Water Algae of Victoria.* By
HENRY WATTS, Esq., of Warrnambool.

[Read 21st November, 1864.]

During my residence in this colony I have collected various species of fresh-water algae and desmidiaceæ, and believing at present there is no record of these plants having been found in this colony, I am induced to present to the Royal Society, a list with localities of such specimens as have come under my observation :

NAME.		LOCALITY.	
1.	<i>Micrasterias crenata</i> ...	...	Swamp, Ballaarat.
2.	<i>Cosmarium connatum</i> ...	...	River Yarra, Heidelberg.
3.	" <i>undulatum</i> ...	...	River Yarra, Heidelberg.
4.	<i>Staurostrum paradoxum</i> ...	...	Swamp, Ballaarat.
5.	" <i>gracile</i> ...	...	River Yarra, Melbourne, and Yan Yean water, Melbourne.
6.	<i>Docidium nodosum</i> ...	...	Swamp, Ballaarat.
7.	" <i>clavatum</i> ...	...	do. do.
8.	" <i>Ehrenbergii</i> ...	...	do. do.
9.	" <i>minutum</i> ...	...	do. do.
10.	" <i>verticillatum</i> ...	...	do. do.
11.	" <i>baculum</i> ...	...	do. do. and the River Yarra. Heidelberg.